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Pictures courtesy of pexels.com

Why don't you love me back, open-source?

One only truly gains by giving back as much



#EmbeddedOSSummit @handle



Linaro

- Founded in 2010, announced @ Computex by initial members
- Formed to provide “new resources and industry alignment for open-source software developers using Linux”
- Introduced support for Arm SoCs in open-source that had been delayed and hindered by industry fragmentation
- Collaborative engineering
 - Consolidating Arm codebase
 - Collaborating to create open technology and standards
 - Fostering open-source engineering excellence
 - Reducing costs of development by sharing resources
- Developer Services
 - Proliferating open-source in devices
 - Partnering with device makers in bringing to market production-grade open-source



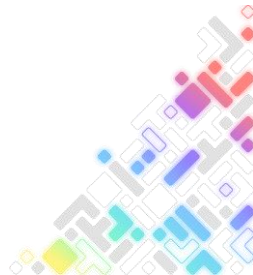
Davide Ricci

Director Developer
Services

Linaro has become the powerhouse behind the Arm open-source software ecosystem development



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The Seven Stages of every Relationships(*)(**)

(*) Applies to engineers, too

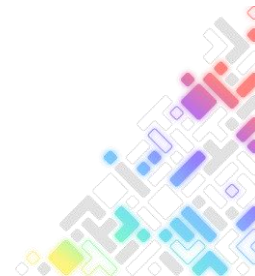
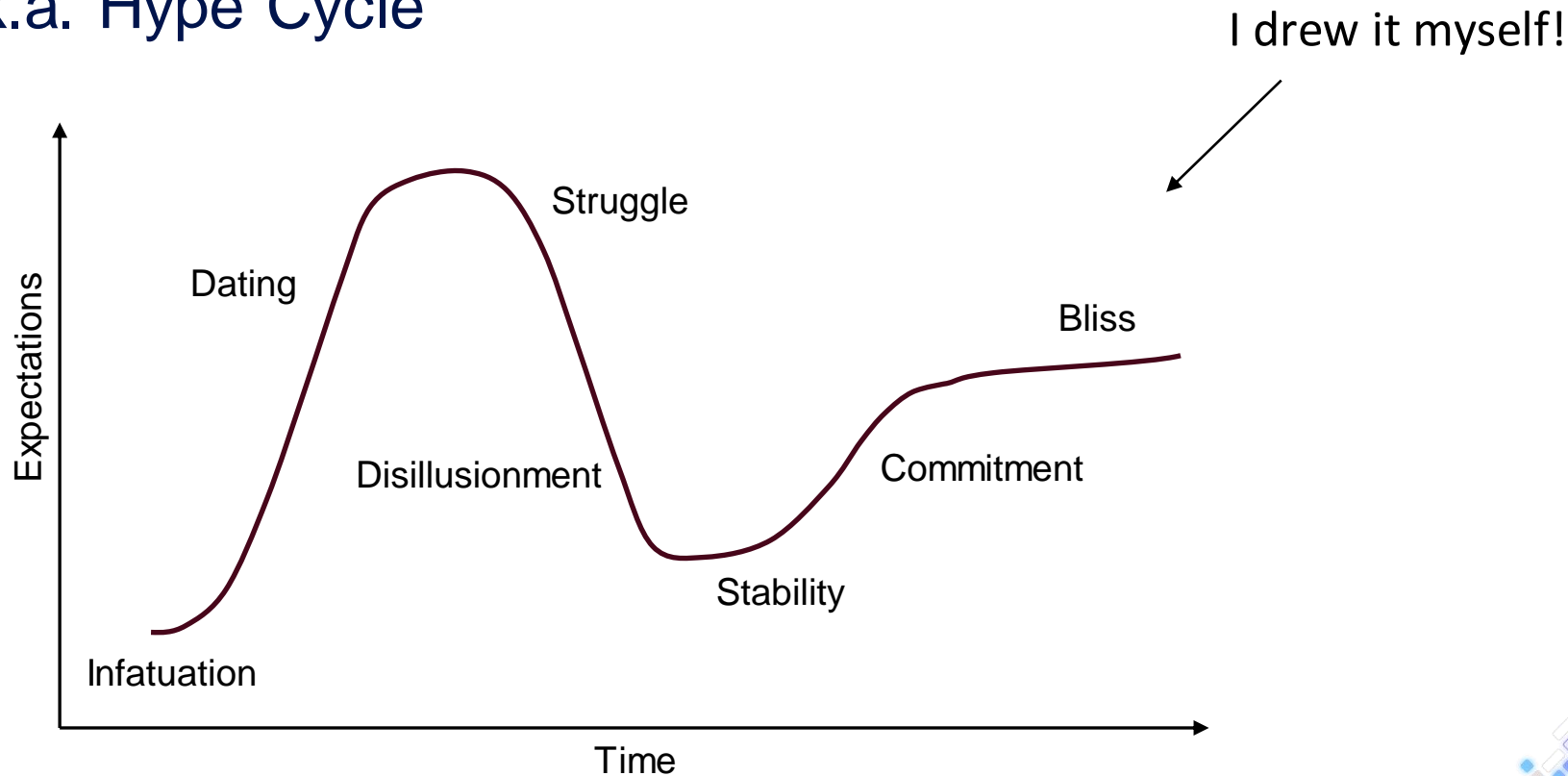
(**) Yes, also hardware engineers



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a.k.a. Hype Cycle



1. Infatuation



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That first look...

- At a friend's "pizza and hacking" party
- At a Linux Foundation or Linaro conference
- At "Operating Systems Principles" class

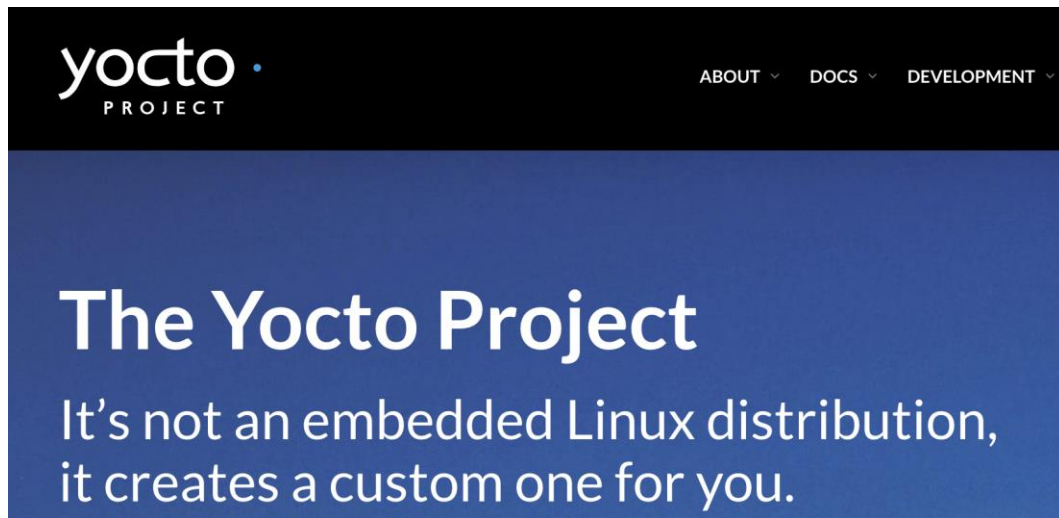
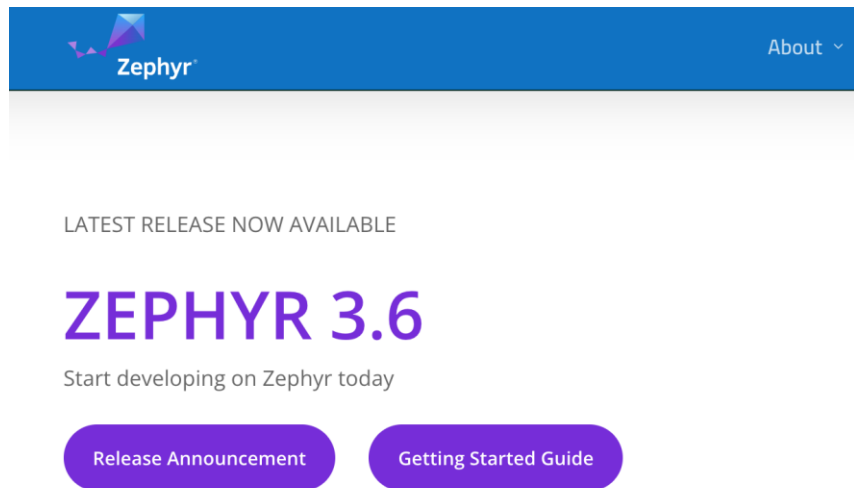


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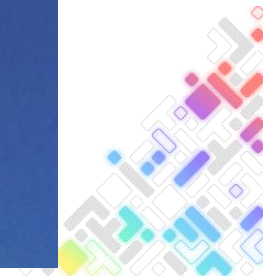


...that sparks curiosity

- Check-them out online
- Do they have same interests?
- Do they share the same passions?

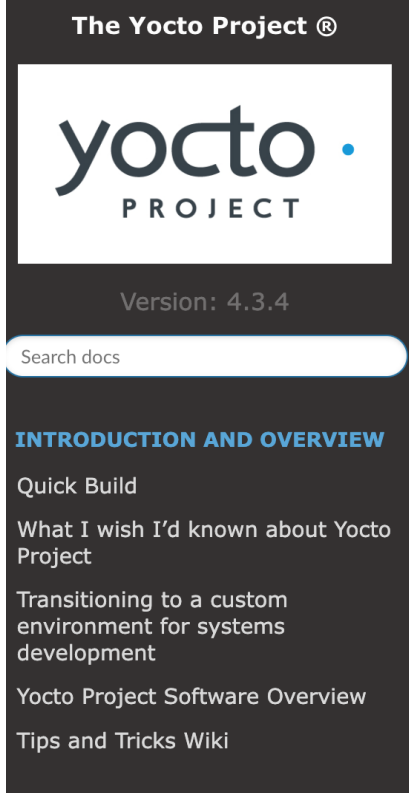


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Encouraging first feedback

- Readily available documentation
 - Yet quite complicated website (that's a plus!)
- Vast library of manuals targeting different personas
- Well documented list of functionalities
- Broad hardware support
- Predictable release cadence and versioning
- Compatibility program
- Community channels and mailing lists
 - No signs of RTFM'isms
- Industry backing



Current Release Series

Codename	Series Version	Originally Released	Latest Release	Status	Downloads	Release Notes
Scarthgap	5.0			Active Development		
Nanbield	4.3	October 2023	4.3.4 / March 2024	Stable Release	Download	Release Notes
Kirkstone	4.0	April 2022	4.0.17 / March 2024	LTS until Apr. 2026	Download	Release Notes
Dunfell	3.1	April 2020	3.1.32 / March 2024	LTS until Apr. 2024	Download	Release Notes

And so you git going!

(or call, or text, or more modern ways to break the ice)

```
$ git clone git://git.yoctoproject.org/poky
Cloning into 'poky'...
remote: Counting
objects: 432160, done. remote: Compressing objects: 100%
(102056/102056), done. remote: Total 432160 (delta 323116), reused
432037 (delta 323000) Receiving objects: 100% (432160/432160), 153.81 MiB | 8.54 MiB/s,
done.
Resolving deltas: 100% (323116/323116), done.
Checking connectivity... done.
```



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2. Dating



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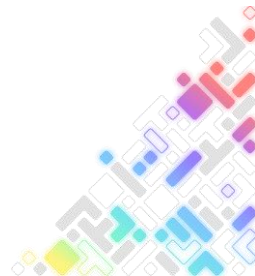
First date, virtual

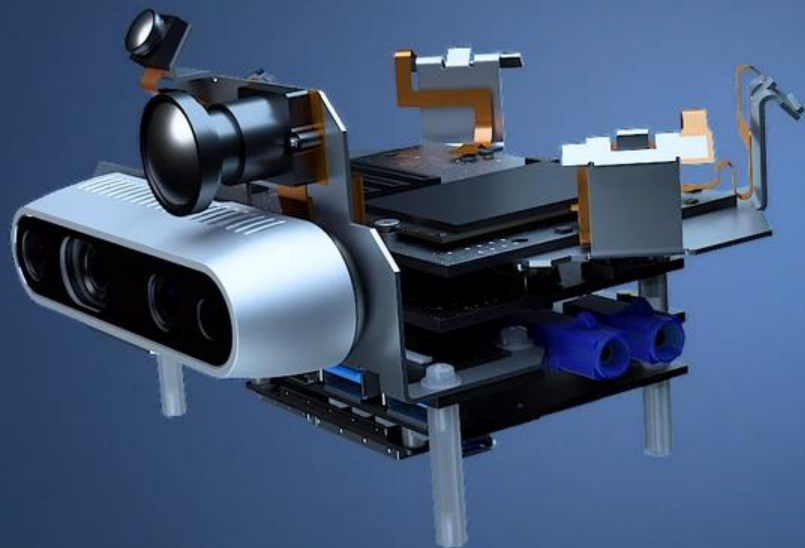
- Some meet on zoom, some like QEMU better
- Good selection of userspace bundles
 - Yocto Project calls them target
 - From minimal headless to full graphical environment
- Run OS image directly on your host machine
 - runqemu
 - cross-architecture

```
$ cd poky
$ git checkout -t origin/scarthgap -b firstdate
$ git pull
$ source oe-init-build-env
$ echo "This might not work, meant to be informative"
$ MACHINE=qemuarm64 bitbake core-image-minimal
$ runqemu qemuarm64 nographic
```



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Second date, let's git physical

- Qualcomm Robotics RB5 Development Kit
- Support introduced via meta-qcom layer hosted at git.yoctoproject.org/meta-qcom

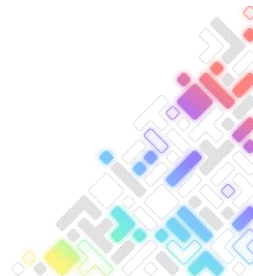


www.himixion.com

```
$ cd poky
$ git clone https://git.yoctoproject.org/meta-qcom
$ cd build
$ bitbake-layers add-layer ../meta-qcom
$ echo "This might not work, meant to be informative"
$ MACHINE=qcom-armv8a bitbake core-image-minimal
```



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Dating with friends

- Bullish thanks to real progress, real fast
- Share results with coworkers and manager
- Talk about this with family and share your excitement
- Stand behind the proposal of using it in production



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3. Struggle



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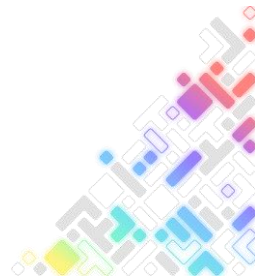


Schedule, requirements, expectations

- Time pressure: product launch date is set
- Limitations: Hardware shortage
- Availability: boot time and usability requirements
- Responsiveness: Real time, video encoding and decoding, frame rate and video resolution
- Constraints: memory and storage
- People: Application developers demands (libraries, SDK, questions and how-to's)



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Power through - Round One

Target: QEMU

- Branch off and fork (just for some days, ok?)
- Pull additional drivers, packages, libraries from different repositories
- Trim packages manifest and remove unnecessary software
 - Adding to core-image-minimal was too time consuming
- Patch configuration files, code
- Package it all up in a separate layer
- Export SDK and OS image for Applications Developers



Power through - Round Two

Target: real hardware

- Try to rebase and align to mainstream
 - Yocto Project release
 - Additional drivers, packages from different repositories
- Add off-tree patches (i.e. preempt_rt,...)
- Measure boot time, memory usage, storage, context switch and system responsiveness
- Delay bunch of services, move to modules some built-in kernel drivers, trim manifest
- Change processes priority
- Measure fps and resolution
- Run intensive benchmark
- Patch configuration files, code
- Update SDK and OS image for Applications Developers



Power through - Round Three Integration

- Add applications to filesystem
- Measure boot time, memory usage, context switch and system responsiveness
- Delay bunch of services, move to modules some built-in kernel drivers
- Change processes priority
- Measure fps and resolution
- Run intensive benchmark
- Fix regressions
- Patch configuration files, code
- Update SDK and OS image





4. Disillusion



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Technical debt:

In software development and other information technology fields, technical debt (also known as design debt or code debt) is the implied cost of future reworking required when choosing an easy but limited solution instead of a better approach that could take more time. (source Wikipedia)

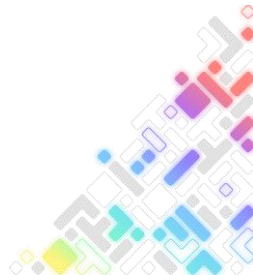


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The cost of branching

- The longer the separation lasts, the higher the cost of ownership
 - Tag and branch might be necessary, better if done close to product shipment
 - Trade off between small incremental in field updates or full upgrades
- Open-source is a train that keeps on chugging
 - New features but also bug fixes against “latest”
 - Adapting features and fixes to an older version might become unbearable cost and force an upgrade
- Same applies to CVEs and licensing information



Where's my SBOM?



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5. Stability



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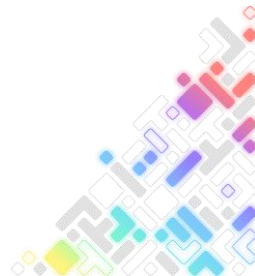


It's all about knowledge and expectations

- Open-source is an innovation engine tuned for **speed**
- Products require **stability**
- Fast progress during evaluation provides a false sense of readiness
 - Reference platforms like Yocto or Zephyr are designed to get you through prototyping and SoC selection as fast as possible
- Reference platforms are not products
 - Assume you'll make changes wherever necessary



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6. Commitment



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Know ingredients and supply chain

- Identify alternatives for all critical components
- Assess and rate:
 - Technical viability
 - Community and industry support
 - Maturity (past or future based on participation and investments)
- Prefer open-source and open governance
- Track and know when to pivot (project going stale, licensing related risks,...)
- Have a roadmap that takes in account the different components release timing



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Invest in infrastructure































- Repositories tracking and management
- Branching strategies, contributions review and management
- Auto-builders, sanity checks
 - Define and enforce your policy
- Remote devices sharing and testing
 - Hardware is always lacking
- Artifacts generation
- Staff it!

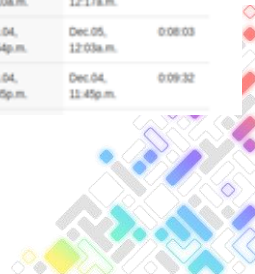
LAVA / Scheduler / Jobs / Healthcheck

Health Check Jobs

[All Jobs](#)
[Active Jobs](#)
[Queued Jobs](#)
[Healthcheck Jobs](#)
[Job Errors](#)

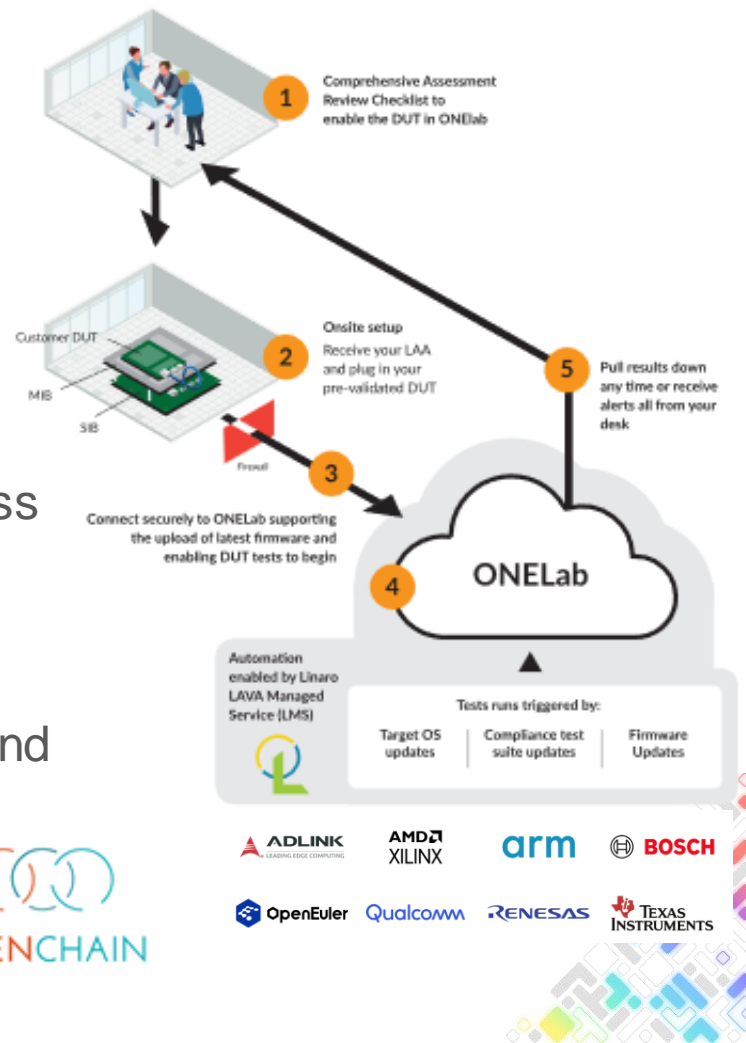
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4021742	  	Complete	x15-01	x15	lab-health-x15 extended	lava-health	Dec.04, 11:35p.m.	Dec.04, 11:45p.m.	0:09:32



Design for compliance

- Vulnerabilities, Licensing
- Industry Standards
- Build a SBOM incrementally
- Identify risks as early as possible
- Integrate compliance into development process
- Make compliance gating contributions
- Fossology, ScanOSS, etc. take you (maybe) half-way through
- Hire an IP auditor, design an IP Policy, train and audit

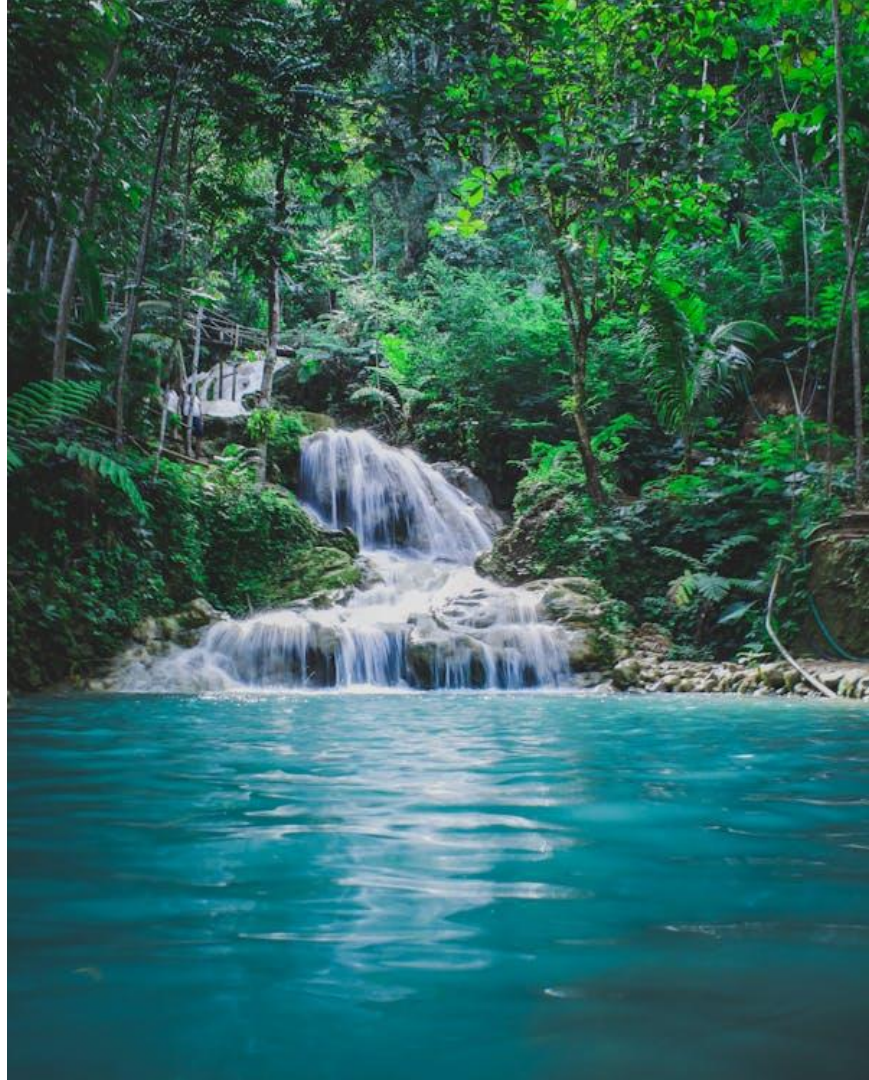


Healthy levels of technical debt

- Upstream, upstream, upstream
- Dedicate part of team capacity to upstreaming (i.e. 20-25%)
- Make it a high-priority task during sprint planning
- Make it a release gating criteria (i.e. 80% of changes upstreamed)



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Participate and influence

- Drive and predict, don't follow and adjust
- Contribute time and money to open governance
 - Especially software components critical to your products
- Keep yourself informed
- Seek advice



7. Bliss



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Join us at Linaro Connect, where innovation meets collaboration!

Discover the future of ARM open-source software, network with industry leaders, engineers, and ARM software experts, and don't forget the Linaro Connect hacking sessions.

Let's connect, learn, and innovate together.

May 14-17 2024

Linaro Connect will take place at Melia Avenida America, Madrid, Spain.

Be part of this unique event!

REGISTER

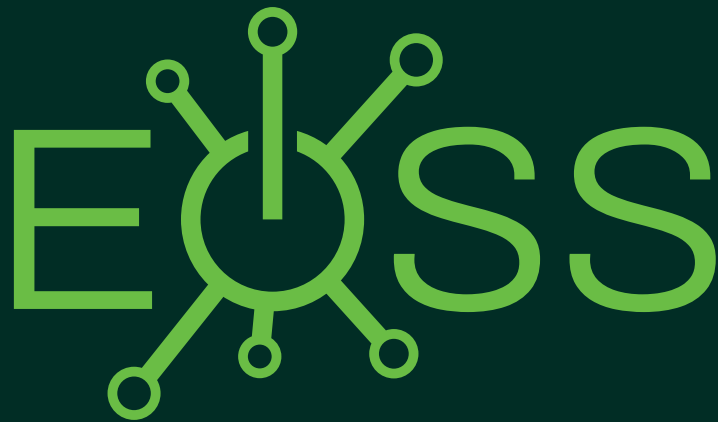
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